SCIENCE

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*NATURE STUDY AND MORAL CULTURE.**

IN making a plea for nature study as a means of moral culture I do not wish to make an over-statement, nor to claim for such study any occult or exclusive power. It is not for us to say, so much nature in the schools, so much virtue in the scholars. The character of the teacher is a factor which must always be counted in. But the best teacher is the one that comes nearest to nature, the one who is most effective in developing individual wisdom. To seek knowledge is better than to have knowledge.

The essence of character building lies in action. Precepts of virtue are useless unless they are built into life. At birth or before, "the gate of gifts is closed." It is the art of life, out of variant and contradictory materials passed down to us from our ancestors, to build up a coherent and effective individual character. Character building is action, not imitation. The chief value of nature study in character building is that, like life itself, it deals with realities. The experience of living is of itself a form of nature study. One must, in life, make his own observations, frame his own inductions, and apply them in action as he goes along. The habit of finding out the best thing to do next and then doing it is the basis of character. A strong character is built up by doing, not by imitation, nor

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by feeling, nor by suggestion. Nature study if it be genuine is essentially doing. This is the basis of its effectiveness as a moral agent. To deal with truth is necessary if we are to know truth when we see it in action. To know truth precedes all sound morality. There is a great impulse to virtue in knowing something well. To know it well is to come in direct contact with its facts or laws; to feel that its qualities and forces are inevitable. To do this is the essence of natures study in all its forms.

The claim has been made that history treats of the actions of men, and that it therefore gives the student the basis of right conduct. But neither of these propositions is true. History treats of the records of the acts of men and nations. But it does not involve the action of the student himself. The men and women who act in history are not the boys and girls we are training. Their lives are developed through their own efforts, not by contemplation of the efforts of others. They work out their problem of action more surely by dissecting frogs or hatching butterflies than by what we tell them of Lycurgus or Joan of Arc. Their reason for virtuous action must lie in their own knowledge of what is right, not in the fact that Lincoln or Washington or William Tell or some other half-mythical personage would have done so and so under like conditions. The rocks and shells, the frogs and lilies, always tell the absolute truth. Association with these, under right direction, will build up a habit of truthfulness, which the lying story of the cherry tree is powerless to effect. If history is to be an agency for moral training it must become a nature study. It must be the study of original documents. When it is studied in this way it has the value of other nature studies. But it is carried on under great limitations. Its manuscripts are scarce, while every leaf on the tree is an original document. When a thousand are used or used up, the archives of nature are just as full as ever. From the intimate affinity with the problems of life, the problems of nature study derive a large part of their value. Because life deals with realities, the visible agents of the overmastering fates, it is well that our children should study the real rather than the conventional. Let them come in contact with the inevitable instead of the made-up, with laws and forces which can be traced in objects and forms actually before them rather than with those which seem arbitrary or which remain inscrutable. To use concrete illustrations, there is a greater moral value in the study of magnets than in the distinction between shall and will, in the study of birds or rocks than in that of diacritical marks or postage stamps, in the development of a frog than in the longer or the shorter catechism, in the study of things than in the study of abstractions. There is doubtless a law underlying abstractions and conventionalities, a law of catechisms, or postage stamps, or grammatical solecisms, but it does not appear to the student. Its consideration does not strengthen his impression of inevitable truth. There is the greatest moral value as well as intellectual value in the independence that comes from knowing, and knowing that one knows and why he knows. This gives a spinal column to character, which is not found in the flabby goodness of imitation or the hysteric virtue of suggestion. Knowing what is right and why it is right before doing it is the basis of greatness of character.

The nervous system of the animal or the man is essentially a device to make action effective and to keep it safe. The animal is a machine in action. Toward the end of motion all other mental processes tend. All functions of the brain, all forms of nerve impulse, are modifications of the simple reflex action, the automatic transfer of

sensations derived from external objects into movements of the body.

The sensory nerves furnish the animal or man all knowledge of the external world. The brain, sitting in absolute darkness, judges these sensations, and sends out corresponding impulses to action. The sensory nerves are the brain's sole teachers; the motor nerves and through them the muscles are the brain's only servants. The untrained brain learns its lessons poorly and its commands are vacillating and ineffective. In like manner the brain which has been misused shows its defects in ill-chosen action, the action against which nature protests through her whip of misery. In this fact that nerve alteration means ineffective action, lying brain and lying nerves, rests the great argument for temperance, the great argument against all forms of nerve tampering, from the coffee habit to the 'protracted meeting.'

The senses are intensely practical in their relation to life. The processes of natural selection make and keep them so. Only those phases of reality which our ancestors could render into action are shown to us by our senses. If we can do nothing in any case, we know nothing about it. The senses tell us essential truth about rocks and trees, food and shelter, friends and enemies. They answer no problems in chemistry. They tell us nothing about atom or molecule. They give us no ultimate facts. Whatever is so small that we cannot handle it is too small to be seen. Whatever is too distant to be reached is not truthfully reported. The 'X-rays' of light we cannot see, because our ancestors could not use them. The sun and stars, the clouds and the sky, are not at all what they appear to be. The truthfulness of the senses fails as the square of the distance increases. Were it not so we should be smothered by truth. We should be overwhelmed by the multiplicity of our own sensations, and truthful response in action would become impossible. Hyperæsthesia of any or all of the senses is a source of confusion, not of strength. It is essentially a phase of disease and shows itself in ineffectiveness, not in increased power. Besides the actual sensations, the so-called realities, the brain retains also the sensations which have been and are not wholly lost. Memory pictures crowd the mind, mingling with pictures which are brought in afresh by the senses. The force of suggestion causes the mental states or conditions of one person to repeat themselves in another. Abnormal conditions of the brain itself furnish another series of feelings with which the brain must deal. Moreover the brain is charged with impulses to action passed on from generation to generation, surviving because they are useful. With all these arises the necessity for choice as a function of the mind. The mind must neglect or suppress all sensations which it cannot weave into action. The dog sees nothing that does not belong to its little world. The man in search of mushrooms, 'tramples down oak trees in his walks.' To select the sensations that concern us is the basis of the power of attention. The suppression of undesired actions is the function of the will. To find data for choice among the possible motor responses is a function of the intellect. Intellectual persistency is the essence of individual character.

As the conditions of life become more complex it becomes necessary for action to be more carefully selected. Wisdom is the parent of virtue. Knowing what should be done logically precedes doing it. Good impulses and good intentions do not make action right or safe. In the long run action is tested, not by its motives, but by its results.

The child when he comes into the world has everything to learn. His nervous system is charged with tendencies to reaction

and impulses to motion, which have their origin in survivals from ancestral experience. Exact knowledge by which his own actions can be made exact must come through his own experience. The experience of others must be expressed in terms of his own before it becomes wisdom. Wisdom is knowing what it is best to do next. Virtue is doing it. Doing right becomes habit if it is pursued long enough. It becomes a 'second nature' or a higher heredity. The formation of a higher heredity of wisdom and virtue of knowing right and doing right is the essence of character building. The moral character is based on knowing the best, choosing the best and doing the best. It cannot be built up on imitation. By imitation, suggestion and conventionality the masses are formed and controlled. To build up a man is a noble process, demanding materials and methods of a higher order. The function of individual education is to break up the masses. Only the robust man can make history. Others may adorn it, disfigure it or vulgarize it. The growth of man is the assertion of individuality.

The first relation of the child to external things is expressed in this: What can I do with it? What is its relation to me? The sensation goes over into thought, the thought into action. Thus the impression of the object is built into the little universe of his mind. The object and the action it implies are closely associated. As more objects are apprehended, more complex relations arise, but the primal condition remains. What can I do with it? Sensation, thought, action—this is the natural sequence of each completed mental process. As volition passes over into action, so does science into art, knowledge into power, wisdom into virtue.

By the study of realities wisdom is built up. In the relation of objects he can touch and move, the child comes to find the limitations of his power, the laws that govern phenomena and to which his actions must be in obedience. So long as he deals with realities these laws stand in their proper relation. "So simple, so natural, so true," says Agassiz. "This is the charm of dealing with nature herself. She brings us back to absolute truth so often as we wander."

So long as a child is led from one reality to another, never lost in words or in abstractions, so long this natural relation remains. "What can I do with it?" is the beginning of wisdom. "What is it to me?" is the basis of personal virtue.

So long as a child remains about the home of his boyhood he knows which way is north and which is east. He does not need to orient himself, because in his short trips he never loses his sense of space direction. But let him take a rapid journey in the cars or in the night and he may find himself in strange relations. The sun no longer rises in the east, the sense of reality in direction is gone, and it is a painful effort for him to join the new impressions to the old. The process of orientation is a difficult one, and if facing the sunrise in the morning were a deed of necessity in his religion this deed would not be accurately performed.

This homely illustration applies to the child. He is taken from his little world of realities, a world in which the sun rises in the east, the dogs bark, the grasshopper leaps, and the water falls, and the relations of cause and effect appear simple and natural. In these simple relations moral laws become evident. "The burnt child dreads the fire," and this dread shows itself in action. The child learns what to do next, and to some extent does it. By practice in personal responsibility in little things, he can be led to wisdom in large ones. For the power to do great things in the moral world comes from doing the right

in small things. It is not often that a man who knows that there is a right does the wrong. Men who do wrong are either ignorant that there is a right or else they have failed in their orientation and look upon right as wrong. It is the clinching of good purposes with good actions that makes the man. This is the higher heredity; that is not the gift of father or mother, but is the man's own work on himself. The impression of realities is the basis of sound morals as well as of sound intellect. By adding near things to near, the child tends to grow into wisdom. 'Knowledge set in order' is science.

Nature study is the beginning of science. It is the science of the child. To the child training in methods of acquiring knowledge is more valuable than knowledge itself. In general throughout life sound methods are more important than sound information. Self-direction is more important than innocence. The fool may be innocent; only the sane and the wise can be virtuous.

It is the function of science to find out the real nature of the universe. Its purpose is to eliminate the personal equation and the human equation in statements of truth. By methods of precision of thought and instruments of precision in observation it seeks to make our knowledge of the small, the distant, the invisible, the mysterious, as accurate as our knowledge of the common things men have handled for ages. It seeks to make our knowledge of common things exact and precise that exactness and precision may be translated into action. The ultimate end of science, as well as its initial impulse, is the regulation of human conduct. To make right action possible and prevalent is the function of science. The 'world as it is' is the province of science. In proportion as our actions conform to the conditions of the world as it is do we find the world beautiful, glorious, divine. The truth of the 'world as it is' must be the ultimate inspiration of art, poetry and religion. The world, as men have agreed to say it is, is quite another matter. The less our children hear of this, the less they will have to unlearn in their future development.

When a child is taken from nature to the schools he is usually brought into an atmosphere of conventionality. Here he is not to do, but to imitate; not to see nor to handle, nor create, but to remember. He is, moreover, to remember not his own realities, but the written or spoken ideas of others. He is dragged through a wilderness of grammar with thickets of diacritical marks into the desert of metaphysics. He is taught to do right, not because right action is in the nature of things, the nature of himself and the things about him, but because he will be punished somehow if he does not.

He is brought into a medley of words without ideas. He is taught declensions and conjugations without number in his own and other tongues. He learns things easily by rote, so his teachers fill him with rote learning. Hence grammar and language have become stereotyped as education, without a thought as to whether undigested words may be intellectual poison. And as the good heart depends on the good brain, undigested ideas become moral poison as well.

In such manner the child is bound to lose his orientation as to the forces which surround him in life. If he does not recover it he will live in a world of mixed fancies and realities. Nonsense will seem half truth, and his appreciation of truth will be vitiated by its lack of clearness of definition, by its close relation to nonsense. That this is no slight defect can be shown in every community. There is no intellectual craze so absurd as not to have a following among educated men and women. There is no scheme for the renovation of

the social order so silly that educated men will not invest their money in it. There is no medical fraud so shameless that educated men will not give it their certificate. There is no nonsense so unscientific that men called educated will not accept it as science. It should be a function of the schools to build up common sense. Folly should be crowded out of the schools. We have built costly lunatic asylums for its accommodation. That our schools are in a degree responsible for current follies there can be no doubt. We have among us many teachers who have never seen a truth in their lives. There are many who have never felt the impact of an idea. There are many who have lost their own orientation in their youth, and who have never since been able to point out the sunrise to others. It is no extravagance of language to say that diacritical marks lead to the cocoaine habit, nor that the ethics of metaphysics points the way to the higher foolishness. There are many links in the chain of decadence, but its finger posts all point downward.

"Three roots bear up dominion, knowledge, will, the third obedience." This statement which Lowell applies to nations belongs to the individual man as well. It is written in the structure of his brain: Knowledge, Volition, Action; and all three elements must be sound if action is to be safe or effective.

But obedience must be active, not passive. The obedience of the lower animals is automatic, and therefore in its limits measurably perfect. Lack of obedience means the extinction of the race. Only the obedient survive, and hence comes about obedience to 'sealed orders,' obedience by reflex action in which the will takes little part.

In the early stages of human development the instincts of obedience were dominant. Great among these was the instinct of conventionality by which each man follows the path others have found safe. The Church and the State, organizations of the strong, have assumed the direction of the weak. It has often resulted that the wiser this direction the greater the weakness it was called on to control. The 'sealed orders' of human institutions took the place of the automatism of instinct. Against 'sealed orders' the individual man has been in constant protest. The 'Warfare of Science' was part of this long struggle. The Reformation, the Revival of Learning, the Growth of Democracy, are all phases of this great conflict. The function of democracy is not good government. If that were all it would not deserve the efforts spent on it. Better government than any king or congress or democracy has yet given could be obtained through the automatic processes of competitive examinations. By this we could get along with one-half our number of rulers and at one-fourth the present cost. Even an ordinary intelligence office or employment bureau for statesmen would serve us better than we are served by caucus and convention. But not for long. The people who could be ruled in this way would be a people not worth saving. But this is not the point at issue. Government too good as well as too bad may have a baneful influence on men. Its character is a secondary matter. The function of self-government is to intensify individual responsibility, to promote abortive attempts at wisdom, through which true wisdom may come at last. Democracy is a nature study on a grand scale. The Republic is a huge laboratory of civics, a laboratory in which strange experiments are performed, but by which, as in other laboratories, wisdom may arise from experience, and having arisen may work itself out into virtue.

"The oldest and best endowed university in the world," Dr. Parkhurst tells us, "is life itself." "Problems tumble easily apart in the field that refuse to give up their secret in the study or even in the closet.

Reality is what educates us, and reality never comes so close to us with all its powers of discipline as when we encounter it in action. In books we find truth in black and white, but in the rush of events we see truth at work. It is only when truth is busy and we are ourselves personally mixed up in its activities that we learn of how much we are capable, or win the power by which these capabilities can be made over into effect."

Mr. Jackman has well said: "Children always start with imitation, and very few people ever get beyond it. The true moral act, however, is one performed in accordance with a known law that is just as natural as the law which determines which way a stone shall fall. The individual becomes moral in the highest sense when he chooses to obey this law by acting in accordance with it."

Conventionality is not morality and may co-exist with vice as well as with virtue; for the obedience which lasts is the product of individual knowledge and will. It is the progressive response to higher and higher laws and as the individual comes to recognize them in his own experience. The welfare of man is not primarily security from deception and evil influences. It goes with the growth of his power to recognize illusions and to base his action on realities. Obedience induced by deception cannot be permanent. Wrong information, it is true, may lead to right action, as falsehood may secure obedience to a natural law which would otherwise be violated. But in the long run, men and nations pay dearly for every illusion they cherish. For every sick man healed at Denver or Lourdes, ten well men will be made sick. Faith cure and patent medicine feed on the same victims. For every Schlatter who is worshipped as a saint, some equally harmless lunatic will be stoned as a witch. This scientific age is beset by the non-science which its altruism has made safe. The development of the common sense of the people has given security to a vast cloud of follies, which would be destroyed in the unchecked competition of life. It is the soundness of our age which has made what we call its decadence possible. It is the undercurrent of science which has given security to human life, a security which obtains for fools as well as for sages.

For protection against all these follies which so soon fall into vices or decay into insanity, we must look to the schools. A sound recognition of cause and effect in human affairs is our best safeguard. The old common sense of the 'unhighschooled man,' aided by instruments of precision and directed by logic, must be carried over into the schools. Clear thinking and clean acting, we believe, is a product of the study of nature. When men have made themselves wise, in the wisdom which may be completed in action, they have never failed to make themselves good. When men have become wise with the lore of others, the learning which ends in self and does not spend itself in action, they have been neither virtuous nor happy. "Much study is a weariness of the flesh." Thought, without action, ends in intense fatigue of soul, the disgust with all the 'sorry scheme of things entire,' which is the mark of the unwholesome and insane philosophy of pessimism. This philosophy finds its condemnation in the fact that it has never yet been translated into pure and helpful life.

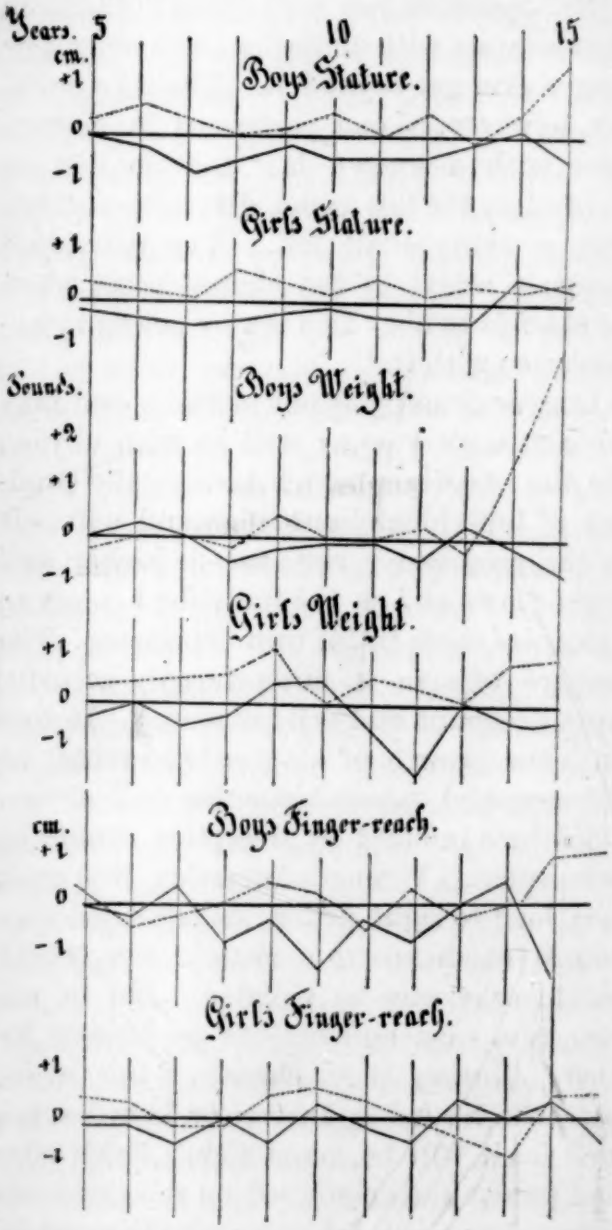
With our children the study of words and abstractions alone may in its degreee produce the same results. Nature studies have long been valued as a 'means of grace' because they arouse the enthusiasm, the love of work, which belongs to open-eyed youth. The child blasé with moral precepts and irregular conjugations turns with delight to the unrolling of ferns and the song of birds. There is a moral training in clearness and

tangibility. An occult impulse to vice is hidden in all vagueness and in all teachings meant to be heard, but not to be understood. Nature is never obscure, never occult, never esoteric. She must be questioned in earnest, else she will not reply. But to every serious question she returns a serious answer. 'Simple, natural and true' should make the impression of simplicity and truth. Truth and virtue are but opposite sides of the same shield. As leaves pass over into flowers and flowers into fruit, so are wisdom, virtue and happiness inseparably related.

David Starr Jordan.

OBSERVATIONS ON THE RELATION OF PHYSICAL DEVELOPMENT TO INTELLECTUAL ABILITY, MADE ON THE SCHOOL CHILDREN OF TORONTO, CANADA.

In the spring of 1892 Dr. Franz Boas, then of Clark University, Worcester, Mass., obtained the necessary permission from the Toronto School Board to make anthropometric observations upon the school children of that city. The observations were made by the teachers of the various schools upon the children under their immediate charge. The teachers were instructed as to the method of taking the measurements by Mr. A. F. Chamberlain of Clark University, and the subsequent work was carried on under his immediate supervision. The measurements made by the teachers were stature, weight and finger reach. Besides the statistical information regarding age, sex, parentage, etc., the teachers were also requested to group the children as to their mental ability into three as nearly as possible equal divisions of 'good,' 'average' and 'poor.' They were to make their estimate, not on the mere class standing, which would be influenced by such irrelevant matters as regularity and punctuality of attendance, etc., but upon the observed natural intellectual quickness, general aptitude for assimilation of ideas and initiative. At the same time that these observations were carried on, a similar series of observations was being made in Worcester. There it was soon made manifest that any such classification of children's mental ability would be very greatly influenced by the mental calibre of the teacher making such classification, and in all cases it rested almost exclusively upon the markings of the class book. There was a further fact which was brought



very sharply to my notice, and that was that in most class rooms there were *no poor scholars*. The teachers were perfectly will-

ing to classify the scholars as of 'good' and 'average' intelligence, but any intimation of the presence of 'poor' or stupid scholars was taken as a personal reflection upon the teacher of the class in question. The result was that what was primarily intended for a classification upon the lines of excellence, mediocrity and stupidity became a classification upon the basis of the two first qualities only. What occurred in Worcester was evidently the key to what occurred in Toronto. There also the 'poor' students were no more than a mere handful and had to be disregarded in making up the material from the point of view of the groups 'good,' 'average,' 'poor,' though not with regard to the general average of the city. Between the other two classes the material was quite evenly distributed.

The stature was taken, the child standing erect, heels together and shoes removed, by means of a straight rod marked in centimeters against which the child stood, an arm at right angles to the upright being brought in contact with the top of its head and the scale read at the nearest centimeter. For finger reach the child was required to stand straight, place the middle finger of one hand against the wall and stretch with both arms at their greatest extent along the rod mentioned before, held horizontally at the height of its arm, the arm of the rod being brought in touch with the middle finger of its other hand and the scale read as before at the nearest centimeter. The weight was taken on the ordinary weighing scales in ordinary indoor costume and was recorded in pounds.

The material has been arranged according to sex and age, the children being grouped according to age within the full year, *i. e.*, children between five and six are classed as five years of age. Thus the children are on an average a half year older than the tables represent. The separation into annual groups being made, the various measurements were then tabulated and the average found. This was done by taking the sum of the observations of one kind within the year and dividing the result by the total number of cases for the same year.

In working up this material it was necessary first to form the general average for each series of observations for the whole school population and then the averages of the two classes of 'good' and 'poor' students. The averages of these two classes were then compared with the general averages.

We have, therefore, in our tables six groups, three for boys and three for girls. Examining the tables we find that the general rule is that the 'poor' children are more fully developed than the 'good' children, though in each series of measurements there are one or two cases where the 'good' children show a higher average than the 'poor.' These cases are generally near the latter end of the series. In the case of girls' stature this is so at fourteen years, of boys' weight at thirteen years, while for girls' weight it is at ten years. In the case of boys' and girls' finger reach, the preponderance of the 'good' is seen at thirteen and fourteen. Again, in boys' weight the 'good' are the heavier from five to seven, inclusive, and the finger reach at six and seven. The most striking difference between the two groups is in the case of stature for both sexes. The 'poor' are the better developed throughout, except, as before noticed, in the case of girls of fourteen and possibly boys of thirteen. There is generally about half an inch difference in the averages of the two groups in favor of the 'poor' students. In the case of weight this difference is not so marked.

The reason for these differences is probably the following: As I have said, the children of 'good' ability were probably so designated from their class standing, and their class standing was undoubtedly in

many cases due to a greater amount of 'pushing' on the part of their parents. This would naturally mean a dimunition in the amount of exercise, resulting in decreased rate of growth, while, on the other hand, their more sedentary life would result in a greater relative girth and consequent weight. The weight depending on the stature as well as on the girth, we have the reason for the less marked difference in weight between these two classes than between the same classes in respect to stature. The difference in stature is fairly constant; the difference in weight fluctuates considerably. We see here, from both points of view, the relative effects of insufficient and of proper exercise. On comparing the difference between the two pairs of groups of the girls and the corresponding groups of the boys we find that there is less contrast in the case of the former than in that of the latter. The diagram illustrating the girls' stature is fairly regular in both groups and the difference fairly constant and comparable with that of boys. But when we examine the weight groups we find the girls' diagrams to be much more irregular and the differences much more marked. It is difficult to estimate the cause of this difference, unless it be that the difference in exercise taken by the two groups of girls is more than that taken by the two groups of boys, though the reverse would seem to be most probable. The meaning of the remarkable irregularity of the curves of finger reach is not apparent. The differences in favor of the 'poor' children is due to the fact that the finger reach bears a fairly constant, though not exact, ratio to the stature. This is seen in the general trend of the curves of stature and of finger reach.

On the whole, we may from these observations consider it safe to say that precocity bears an inverse ratio to bodily development. In making this statement, however, we are directly contradicting the result set forth by Dr. W. Townsend Porter, in his paper on 'The physical basis of precocity and dullness' (Transactions of the Academy of Science of St. Louis, Vol. VI., No. 7). A short discussion will perhaps show the reason for this discrepancy. In the first place, we find that Dr. Porter has grouped his material in two ways; first as to age, and next within the age, as to school grades. In this way he has made the school grade of the pupil the criterion of his mental powers. The policy of this arrangement will be appreciated at once when it is remembered that the school grade of the child depends partly upon the age at which he entered school, *e. g.*, a child who enters the I. grade at nine years of age will naturally not be so far advanced in his studies as a child who enters that grade at six years of age, and who at nine years would naturally be in the IV. grade. Again, it would be necessary to ascertain whether the pupil has been able to attend regularly. The reason of the two children's entrance at the respective ages mentioned might depend upon a variety of causes irrelevant to the question of their mental caliber, as means, health, and, in the case of a large heterogeneous population, knowledge of the language. Any or all of these would serve to determine the child's grade irrespective of its ability. In the material obtained from Toronto this error has been avoided by considering the two questions of school standing in the class and the measurement, and these only. We thus avoid the question of the age at which the child first entered school, and the question whether its attendance has been continuous. Dr. Porter ignores these and evidently proceeds on the hypothesis that all children enter school at the same age and pursue their studies uninteruptedly thereafter, both of which are assuredly far from being the case. Again, while in arranging

his material, he has grouped all children as of the same age who have, *e. g.*, passed their ninth birthday and not yet reached their tenth; he has again ignored the fact that the majority of children enter school at the beginning of the year and not during the term, thus in this way still further throwing out his calculation.

G. M. WEST.

A TWO-HEADED TORTOISE.

INQUIRIES from various quarters have been made so repeatedly for the sequel to the brief story of a young two-headed tortoise, *Chrysemys picta*, published in the *American Journal of Science* for October, 1888, that the author is led to believe that a public account thereof will serve more useful ends than many private ones. In order that the sequel may be more intelligible to all, a brief resumé of the first paper will be given.

The young tortoise, hatched but a day or so, was found in the marshes bordering West River, New Haven, Conn. The carapace, which was somewhat broader than long and slightly distorted, bore the customary legs and tail, but there were two perfectly developed heads and necks.

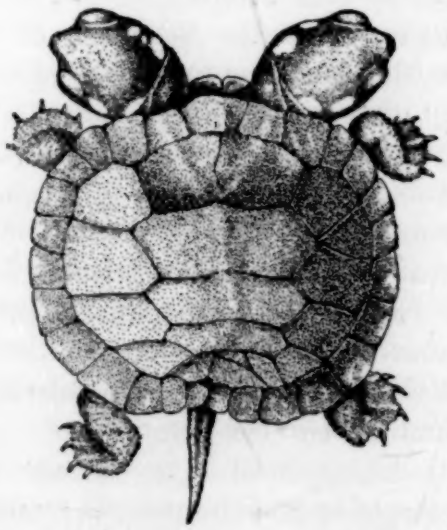


Fig. 1. Dorsal view of the two-headed tortoise *Chrysemys picta*.

The author visited and studied this little monstrosity almost daily for weeks. It lived and thrived and grew appreciably during that time. Its charm was in the very perfection of its imperfection. Such a oneness of two with individuality preserved is not to be found. In one carapace there were two alimentary systems, two nervous

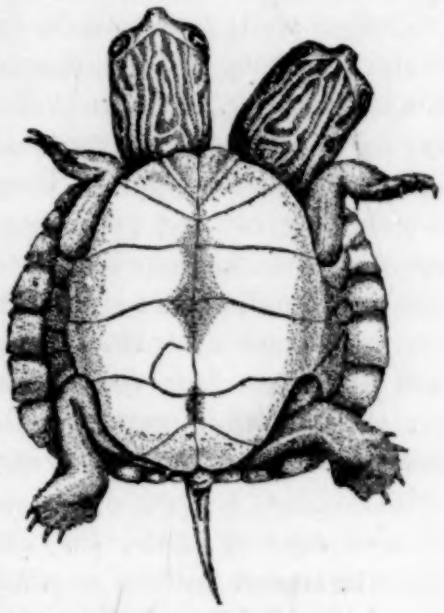


Fig. 2. Ventral view of the same.

systems, two respiratory and circulatory systems, two muscular and bony systems. Each was double in part at least. There were two wills, for the heads fought continually for the rights of their common shell and for their food.

There were two dispositions; the one quicker, more timid and more irascible; the other stolid. Each head could hear, see, eat, drink and breathe independently. Though afterwards acquired, there was originally no concerted action between the right side and the left. However, with surprising frequency, the two did act in unison, and simultaneously, as if there were correlation by a common nervous system.

They might, or they might not, each drink, sleep or swim, as each willed. When one side with its organs and appendages

slept, or was inert, the other with this dead weight as a center could but describe a circle—a course which it found endless. Here then arose a beautiful example of adaptability. It learned to drag itself sideways, wherever it would—over the whole yard. This was the right half (never the left) which has been spoken of as having a timid, quick and irascible temperament. They swam together well, but walked together awkwardly. As they walked, the fore legs acted simultaneously, so in turn the hind legs, leaving alternately the front and back of the shell without support. Thus by a slow teetering, or rocking gait, they could go where they would. In starting they almost invariably pulled persistently in opposite directions, which drew them laboriously backward three or four feet. Resting a moment, they would start together, as described above, and make the circuit of the yard.

With fate against them, they adapted themselves to their condition so admirably, and excited the admiration of so many that a false and exaggerated value was put upon them. Showmen offered sums out of all proportion to the actual value, which were rejected by the owners.

If so highly prized then it should in all consistency have been more zealously guarded. But while at large with other similar pets, a prowling cat singled out this one and pounced upon it. It was secured at once, but not before it had tumbled down the stone steps leading to the cellar.

It was returned to its aquarium, where the right head came out from its protecting shell at once; likewise the left head a half hour later. The next day it was itself again. It ate, walked and swam as usual, save the left head refused food, which was not unusual. The second day it was itself still, though the left head would take no food. On the third day it drooped. Though rallying at times and hurrying about as usual, the left one was soon dead, as were also the left legs. The cat's claw had pierced the neck close to the shell. The distress and uneasiness of the surviving half was very apparent. All its energies and activities were redoubled, yet it died in two and one-half hours later. Up to this time its only sign of weakness was an occasional gaping as if for more air.

This little monstrosity's short life continued from the first of June to the middle of September.

Erwin Hinckley Barbour.
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SOME DIFFICULTIES IN THE PRESENTATION OF THE PERIODIC LAW.

The Periodic Law contains so much that is true, and promises so much further revelation as to the connection between the elements and the relations of their atomic weights, valence and other properties, that its permanent position in the science is assured. It truly deserves the name of the Natural System, first given it by Mendeléeff, but abandoned because it had been used some twenty years before by Odling for a very different sort of arrangement. It stands before us to-day as the statement of a natural law, though as yet undeveloped and imperfectly understood. There can, therefore, be no question as to the acceptance of the law of the inter-dependence of the atomic weights and other properties, and the peculiar relationship of the elements now known as the Periodic Law. This must be the basis of the science, and the proper formulation of the law will contribute to a wonderful development of it in the future.

But there may well be question as to the acceptance of any of the present statements of the law. The systematic arrangements of Mendeléeff or Meyer or Bayley are all necessarily tentative because of the serious imperfections in our knowledge. There is a probability that new elements will be dis-

covered. The properties including the important physical constants of even the well-known elements and their compounds are quite imperfectly known. A great deal of the future work of the chemist must be devoted to the detailed and patient study of the multitudinous compounds already known, as well as to the formation of new ones.

The increased knowledge of the future will render changes and modifications necessary in any one of the present systems, or, perhaps, will set all of them aside and evolve out of them one which will perfectly present the truths of the law. Understanding the heading of this paper to refer then not to the law itself, but rather to the present arrangements of the elements under that law, let us briefly look at some of the difficulties in their way.

An impartial observer would notice first the large number of unknown elements, necessary for the completion of most of these arrangements. Mendeléeff has blank spaces for at least thirty-five new elements, or, if a hydrogen period below lithium be granted, then forty-one more elements must be discovered somewhere, or more than one-third of the total supposed number. It would almost seem unreasonable to found any system upon the imperfect knowledge of less than two-thirds of the individuals to be included in it, were it not borne in mind that the ones now known constitute all but a small fraction of the matter of which the universe is composed, and again that they fall in the system in regular consecutive order, leaving only one unoccupied space among the first fifty-two members according to Mendeléeff. Even this blank has been filled, if the recent discovery of an element in monazite having an atomic weight of approximately 100 be confirmed.

Modifications of the Mendeléeff system do not require so large a number of additional elements for their completion, eight or ten satisfying all apparent requirements. In case the Mendeléeff system is correct, where are these to come from? The close scrutiny to which all terrestrial forms of matter have been subjected by chemical and spectroscopic analysis leaves little material to be called upon as the source of these elements. Still the recent discoveries of argon and helium teach us not to be too positive in our exclusion of unknown elements because of past investigations. The so-called rare earths will unquestionably yield several new elements. It seems a great pity that this scarce and valuable material cannot be collected and placed in the hands of some patient investigators whose labors might be supported from some research fund and who could tell us then just what the science had to expect from this source. A further thought is that some of these elements may not occur in nature, but that the future may teach us some way of synthesizing them, and then the whole list can be filled out. The brilliant victory over the difficulties surrounding the chemistry of the sugars and their synthesis, filling out their system so meagerly outlined in nature, would be ground for encouragement as to possible conquests among the elements.

The anomalous position of hydrogen forms a second objection to the Periodic Law. It is not counted in any of the periods of seven or of seventeen. Its introduction into any system in which the arrangement depends upon increasing atomic weight would throw out the sequence of the elements. Placing hydrogen at the head of the system, with connecting lines to all seven of the first period, as has been done by some, is a very questionable expedient. This is simply an unjustifiable return to the Proutian hypothesis, and is a violent distortion of all the facts concerning valence, positive and negative properties etc, for which the table is supposed to stand, and lastly it does not relieve the anomaly of the position.

A second supposition that hydrogen is the initial member of a period of seven which precedes Mendeléeff's typical elements, but which are as yet unknown, is much more plausible. The discovery of helium, and perhaps another element with very low atomic weight, lends strength to this supposition. Certainly the present anomalous position of hydrogen is a serious blot upon the system.

Wurtz has pointed out two difficulties in the system, both of which bear upon the nature of periodicity. The first is the lack of regularity in the differences between successive elements, and the second is that the gradations in properties do not seem to depend upon the degree of these differences. It has been also pointed out that the use of the term periodic in the case of these variations is not a strictly mathematical one, and that these periods, in passing from negative to positive values, should pass through a transition stage of either zero or infinity. It is true that very little has been done to discover the nature or the laws of this so-called periodicity, though some of the modifications of Mendeléeff's table make some points clearer and remove some difficulties. Chemists have generally contented themselves with calling any successive increases or decreases in properties periodic, whether they exhibited any regularity or not. This is too slovenly and unsatifactory for a true science, and those who love the science must labor to remove such a reproach. The obstacles to success are first inaccurate knowledge of the properties, and in some cases the absence of any definite standard of measurement for these properties.

Minor difficulties lie in the relative position of certain elements. Some are far from satisfied with the position assigned the triad, iron, cobalt and nickel. In some respects they are out of line with some of the elements apparently closely allied to them. Perhaps when what Blanchard has called 'cross analogies' are better understood these matters will be made clearer.

In the cases of at least two sets of elements, tellurium and iodine, and cobalt and nickel, the very best determinations of their atomic weights would place them in different relative positions from those demanded by the periodic system. These determinations have been repeatedly revised in the past few years, and yet the system still seems at fault. Which is wrong, the system or the investigations of the atomic weights? So many difficulties surround these determinations, and so many chances for errors lie in their paths, that most will decide in favor of the system and call for more thorough and patient search after impurities and imperfections of methods in the previous determinations.

The discovery of argon and helium has been regarded by some as giving a most telling blow to the periodic system. Article after article has been written on their possible position in the system. Several originators of systems have claimed to have predicted these new bodies. No supposed property nor absence of property staggers these prophets. They have foreseen everything. The whole question is, however, premature. Manifestly the position of any newly discovered element cannot be fixed until two things are definitely settled: first, the elemental character; and secondly, the more salient properties, as atomic weight, valence, etc. These questions are yet to be settled for the substances named, and there are some serious difficulties in the way of those investigating them. Until these questions are answered nothing can be done, and certainly a system which has answered admirably for so many of the elements is not to be given up on the half knowledge and half guess-work which surround the two newly found bodies.

F. P. Venable.

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CURRENT NOTES ON PHYSIOGRAPHY.

HILLS AND PLAINS OF SOUTHEAST LOUISIANA.

THE State Experiment Station at Baton Rouge has just issued a report on the Florida parishes of east Louisiana and the bluff, prairie and hill lands of southwest Louisiana, by W. W. Clendenin, of the State University, with a lucid account of the topography and drainage. East of Baton Rouge the 'pine hills' grade westward into the 'bluff' district toward the Mississippi, and southward into the 'pine flats' toward the sea marsh. The 'pine hills' have a mature topography, produced by pre-Columbian dissection of Lafayette strata, and now thinly veneered by the loam of Columbian submergence. The streams still occupy their pre-Columbian courses, giving typical examples of resurrected drainage. Passing towards the Mississippi the veneer of Columbia thickens; the pre-Columbian topography fades away, and at last disappears beneath the flat cover of 'bluff' or loess. Here the topography is adolescent; extensive interstream plains still standing between narrow, steep-sided valleys. The 'pine flats' are an infantile coastal plain of Columbia clays, so level that the rainfall is hardly gathered into streams; the larger water courses seeming to be the seaward extensions of the resurrected streams from the 'pine hills.'

PIMPLED PRAIRIES OF SOUTHWEST LOUISIANA.

THE same report describes the coastal prairies of southwest Louisiana, upon which there are numerous mounds, especially around the sulphur district of Calcasieu parish, but extending also inland to the 'pine hills' and seaward to the coastal marsh. The mounds are roughly circular in outline, about fifty feet in diameter and up to ten feet in height; always arranged in zones or intersecting systems of lines, never solitary. They are more sandy than the argillaceous prairie, and hence are drier and support trees and a better pasture grass than that of the marshy plain. Clendenin discards Hilgard's explanation of the mounds as ant hills, and follows Hopkins in comparing them to 'mud lumps,' formed by the escape of gas from beneath; adding that the zonal and linear arrangement of the mounds may be accounted for by associating them with the radial and branching fractures that diverge from earthshock centers. According to this theory, ants, like plants, occupy the mounds but do not make them.

LUBBOCK'S SCENERY OF SWITZERLAND.

THIS admirable book (Macmillan, 1896) shows how thoroughly a sagacious amateur may follow, appreciate and transmit to a large circle of readers the best physiographic results gained by geologists and geographers of Switzerland. The many essays and memoirs quoted appear to have been interpreted, and indeed verified on the ground, during the authors' vacations during the past thirty years. Beginning with geological structure, chapters follow on glaciers present and past, rivers, valleys, lakes, influence of strata on form, the Jura, the central plain, the outer Alps and the central massives; then come ten other chapters on districts of particular interest, such as Lake Geneva, Mont Blanc, the Rhine, the Reuss. etc., closing with a general summary. There is no book in English in which so compact and accurate an account of the physiography of Switzerland is to be found. It is on every account to be most warmly welcomed and commended to students, travelling or at home. The contests and exchanges between the several branches of the upper Rhine are well presented, after Heim; but the processes by which a river may come to follow an anticlinal axis, and the many ways in which rivers may come to cross mountain ridges, are not fully appreciated. The delta-like origin of the Rigi conglomerates, now overturned; the

'dead valleys' of the plain, once occupied by larger streams; the warping of valleys to produce lakes—these and many other topics are most acceptably treated.

REPORT OF THE LONDON GEOGRAPHICAL CONGRESS.

A VOLUME of almost a thousand pages, edited by Dr. Mill, now presents in full and in the original language the papers read at the Sixth International Geographical Congress in London last summer (Murray, 1896). The volume is so large, and so much mention was made of the proceedings of the Congress in current journals, that an abstract of the Report is now neither possible nor necessary. The account by Levasseur of the status of geographical instruction in France is of much value as illustrative of a highly formulated system. Penck presents his geomorphological nomenclature, in which he introduces the idea of stage of development, but hardly extends it as far as seems desirable to many, some of his fundamental forms being the products of erosion. On the whole, physiographical problems attracted little attention alongside of subjects of greater popular interest, such as polar exploration, or the habitability of Africa by the white race. Lallemand, director of general levellings in France, makes the following surprising statement, displacing a view supposed to be orthodox: The inequality of level between the Mediterranean and the Atlantic, determined by former French and Spanish levels, and explained by the different densities in the two bodies, does not exist; the illusory results being due to systematic errors of early observations, and to the superficial character of the observations made on the salinity of sea water. Whether the density currents at the Strait of Gibraltar must also be given up is not told.

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CURRENT NOTES ON METEOROLOGY.

RELATIVE HUMIDITY OF NEW ENGLAND.

BULLETIN No. 19 of the Weather Bureau is a *Report on the Relative Humidity of Southern New England and other Localities*, by A. J. Henry. The investigation, the results of which are now published, was undertaken in order to ascertain how the humidity conditions of the South compare with those of New England and other places where cotton is manufactured, cotton manufacture, as is well known, being to a considerable extent dependent on the humidity of the atmosphere. It appears that hitherto in the development of the cotton manufacturing industry but little account has been taken of climatic conditions as affecting the quantity or quality of the output, and that the control of temperature and humidity by artificial means is the final solution of the problem when the establishment of mills in a relatively dry section is contemplated.

PROTECTION FROM FROST.

THE Weather Bureau has issued a short pamphlet entitled *Injury from Frost and Methods of Protection* (Weather Bureau No. 86,) by Hammon. The formation of frosts; the best locations for orchards or gardens to avoid injury by frost; the methods of protection and times when protection is needed, are considered.

TORNADOES IN TEXAS, MAY 12 AND 15.

DURING the spring a number of destructive tornadoes were recorded in our Southern and Western States. The local tornadoes which occurred in northern Texas on May 12 and 15 are described by Cline in Special Bulletin No. 8 of the Texas Climate and Crop Service. On May 12 two distinct tornadoes occurred, and on May 15 four were noted. The usual phenomena accompanied the disturbances.

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CURRENT NOTES ON ANTHROPOLOGY.

NATIVE AMERICAN TEXTILE ART.

A MONOGRAPH of much beauty and interest has lately appeared from the pen of Prof. W. H. Holmes, of the Field Columbian Museum. Its subject is the 'Prehistoric Textile Art of the Eastern United States,' and it a portion of the 13th Annual Report of the Bureau of American Ethnology. The topics taken up are the basketry, matting, cloths, nets, featherwork, embroidery and wattling of the Indians in the region designated, as these arts existed before the arrival of the white man. The primitive methods of spinning and weaving are explained, and the various knots and stitches illustrated by numerous engravings. Incidentally, the styles of clothing in former use are touched upon.

A chapter is added on 'fossil fabrics,' by which is meant those exhumed from caves, mounds, shelters and other deposits supposed by some to be the relics of a pre-Indian population. The result of the investigation here is noteworthy and adds to the evidence that it seems impossible to get away from the Red Indian in the Eastern United States. "Charred cloths from the great mounds are identical in material, combination of parts and texture with the fabrics of the simple savage." Nothing in them indicates a higher development of the art than was possessed by Algonkins and Iroquois.

THE 'SECOND COLUMN' OF THE ACHEMENIDEAN INSCRIPTION.

THE famous inscription in cuneiform characters of the Achemenides is, as most readers are aware, in three columns, each a different language. The first is Old Persian; the third is the Assyrian dialect of the Semitic; but the second has been a standing puzzle. Some claimed it as Dravidian, others as a remote Aryan tongue, but most scholars, following Norris, Rawlinson and Max Müller, looked upon it as 'Turanian,' by which is meant Ural-Altaic. It has been called Susian or Medic, and some have thought it related to the Sumerian or Acadian, of Babylonia.

The first thoroughly satisfactory analysis of its forms which has ever appeared has just been published at Breslau, from the pen of the profound Ural-Altaic scholar, Dr. Heinrich Winkler. He had already announced that this Susic was certainly not Ural-Altaic, nor was the Sumerian. In the present brochure of sixty-five quarto pages he proves that the verb of the Susic is a true verbal, whereas in the Ural-Altaic, like many American languages, it is a noun form; that the relative in the Susic is one that is real and not a mere connective; that the formation of the case relations is wholly distinct; and a number of other vital points.

As the second column is certainly not Altaic, what is it? To this Dr. Winkler replies by assigning a number of cogent reasons for believing it a member of the Caucasic group of related tongues.

His valuable essay, like that which he wrote on the relationship of the Japanese to the Ural-Altaic, has extremely important bearings on the ethnography of Asia. The full title is: 'Die Sprache der Zweiten Columne der Dreisprächigen Inschriften und das Altaische.'

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UNIVERSITY OF PENNSYLVANIA.

SCIENTIFIC NOTES AND NEWS.

ELECTRICAL CONDUCTION AT LOW TEMPERATURES.

IN a Friday evening discourse at the Royal Institution, Prof. J. A. Flemming, F.R.S., recently gave an account of the very interesting researches into the magnetic and electric properties of metals at low temperatures, which have been carried out, during the last four years, in the laboratories of the Royal Institution, by him in conjunction with Prof. Dewar.

According to the report in the London

Times, the lecturer showed that the conductivity of a pure iron wire, at ordinary temperatures only about one-sixth of that possessed by a copper wire of equal size, was increased nine or ten times under the influence of the cold of liquid air. But while pure metals had their conductivity immensely increased by intense cold it was shown that alloys, such as brass or German silver, experienced in the same circumstances a comparatively small increase in conducting power, not more than about ten per cent. By carefully examining with a suitable form of resistance coil the variations in the electric resistance of a large number of chemically pure metals cooled to about 190 degrees, Profs. Dewar and Fleming have established that every pure metal would in all probability have no electrical resistance at the zero of absolute temperature, or, in other words, would become a perfect conductor of electricity. In this condition the passage of an electric current would generate no heat in it. Another consequence would be that a pure metal at the absolute zero would form an absolutely opaque screen to electro-magnetic radiation. These experiments furnished an additional proof that the process by which an electric current was conveyed from place to place was primarily dependent on actions going on outside that which we usually spoke of as a conductor. At the absolute zero any electric power, however large, could be transmitted along metallic wires, however small, without loss of energy, the wire becoming then a mere boundary and the energy-conveying processes being all effected in the non-conductor outside of it. Diagrams were shown illustrating the great increase in the conductivity of mercury on freezing. At its freezing point its conductivity rose fourfold, and beyond that point increased in such a way as to show that at the absolute zero its conductivity would be perfect. The peculiar differences in the resistance of pure and slightly impure bismuth were described, and proof was adduced that the result of taking the electric resistance of a wire of any metal in liquid air afforded a conclusive test of its chemical purity. It was found that the remarkable property possessed by bismuth of undergoing a great increase in electrical resistance when placed in a magnetic field was increased several hundred per cent. by the cold of liquid air. In contrast with metals, carbon and non-metallic bodies increased in electric resistance as their temperature was reduced, this increase continuing to take place as far as the lowest temperature reached. In conclusion, Prof. Fleming laid stress on the value of the knowledge gained about the electrical resistance of metals at low temperatures as a means of testing the purity of a metal almost rivalling the spectroscope in delicacy, and said that the facts collected would prove of importance in judging the validity of existing hypotheses of electric and magnetic action, while at the same time they opened out a wide field for fascinating research in a region hitherto but little explored.

THE DIMINUTION OF CONSUMPTION.

Dr. Arthur Ransome contributes to the *Lancet* (July 11) an article on 'Tuberculosis and Leprosy,' in which he draws a parellel between the two diseases, (1) in their specific causation and in their morphology; (2) in their pathology; (3) in their distribution; (4) in their general history and the conditions favorable or otherwise to their existence; and (5) in their infectiveness and hereditary transmission.

There are many points of similarity between them, and the author states that many authorities are inclined to believe from a study of their morphology that they are identical in character and that their bacilli are modifications of one species altered only by their environment. Dr. Ransome does not, however, regard the diseases as absolutely identical, but believes that they are at least so far alike as to make it permissible from a study of the decline of one complaint and its causes to attempt to glean some idea of the most hopeful means of diminishing the other; and that it is possible to go further and prophesy that as one disease, leprosy, has disappeared from our midst, so the other, tubercle, may also be made to vanish, and that from the recognition of its predisposing causes we may learn in what way it may best be attacked and finally driven from amongst civilized nations.

Leprosy was banished mainly through general sanitary measures and was scarcely affected by direct efforts at preventing contagion. The author considers it, therefore, only necessary

to press forward the general sanitary measures on which he dwells in the article, in order that "we may regard as no Utopian dream the forecast that after only a few more years we may see the total extinction of tubercle in our land."

A chart is appended showing the phthisis rate per 10,000 of the population during the last fifty-eight years. In the year 1838 it stood at the enormous figure of over 38, and in 1894, little more than half a century later, it was only 13.8 —little more than one-third of its former prevalence. A straight line drawn from its highest to its lowest points shows also that its decline has been remarkably steady and generally regular. If phthisis were to continue to diminish in prevalence at the same increasing rate of decline for another thirty years it would then have entirely disappeared.

GENERAL.

IN connection with the proposed railway to the summit of the Jungfrau, it is proposed to establish a series of meteorological stations at which it will be possible to study at various altitudes the relations of temperature, atmospheric pressure, precipitation, etc. The observatory at the summit will cost $20,000.

ACCORDING to *Nature* Dr. N. Busch, of Dorpat, has undertaken, at the request of the University of Dorpat and the Russian Geographical Society of Petersburg, a botanical investigation of the Caucasus. He proposes to visit the hitherto unexplored sources of the rivers Teberda and Maruch in northern Caucasus.

AN expedition under the direction of Lieutenant Werther, accompanied by two geologists, is about to leave Berlin to spend a year or more in exploring Northeast Africa.

Die Natur states that the Austrian deep-sea expedition under the charge of the ichthyologist Dr. Franz Steindachner, the Director of the Royal Vienna Museum, has now returned. The expedition has for seven months been engaged in explorations of the Red Sea on the warship *Pola*.

THE Société Scientifique Antonio Alzate, of Mexico, elected the following honorary members at the recent general meeting: M. Cuenot, professor in the Faculty of Nancy; MM. Fizeau and Lippman, of the Institute of France; M. Ch. Richet, of the Faculty of Medicine, Paris; Dr. G. Brown Goode and Prof. F. H. Bigelow, of Washington; Prof. Röntgen, of Wurtzburg; Lord Rayleigh and Prof. William Ramsay, of London.

THERE will be held, at Sables d' Olonne, from the 3rd to the 7th of September of the present year, an International Congress of Fisheries.

TWO new year books are announced from Paris, one *Annuaire des Musées scientifiques et archéologiques des Départements*, the other *L' Année biologique*, edited under the direction of M. Y. Delage.

SIR WILLIAM MACCORMAC, of St. Thomas' Hospital, has been elected President of the Royal College of Surgeons of England.

THE MACMILLAN CO. announce for early publication a translation of Dr. von Zittel's elaborate Paleontology, by Dr. Charles R. Eastman, of the Museum of Comparative Zoology at Harvard University.

AT the sixty-fourth annual meeting of the British Medical Association, which was held at Carlisle on July 28, 29, 30 and 31, the address in medicine was to be delivered by Sir Dyce Duckworth, lecturer on medicine, St. Bartholomew's Hospital, and that in surgery by Dr. Roderick Maclaren, senior surgeon to the Cumberland Infirmary. The scientific business of the meeting was conducted in nine sections.

THE Millennial Congress of Hygiene and Medicine will be held at Buda-Pesth, September 13th to 16th, under the Presidency of Profs. Koranyi and Ketli. Among the subjects proposed for discussion are the organization of medical aid for the poor, pension and sick funds for medical men, medical councils, etc.

THE third *Congrès Français de Médecine* meets at Nancy on August 6th to 9th. The subjects announced for discussion are The Application of Blood Serums to the Treatment of Diseases, Intravascular Coagulation of Blood and Prognosis of Albuminuria.

IF certain conditions are fulfilled by the City of Chicago the Field Columbian Museum is to receive $2,000,000 as an endowment fund from Marshall Field, the founder of the institute.

THE London Goldsmiths' Company have contributed £1,000 for the extension and better equipment of the scientific laboratories at the Imperial Institute. A research fellowship of the value of £150 annually has been established by the Salters' Company, in connection with the scientific department, for the investigation of new or little known natural products.

IT is stated that Mr. T. Ruddiman Johnston, a Fellow of the Royal Geographical Society, will erect in London a terrestrial globe, showing the earth's surface on a scale of about eighty miles to the inch. Every geographical feature of importance will be shown and named, as well as every city and town having 500 inhabitants or more. The globe will take nearly two years to construct, and Mr. Johnston hopes to have the assistance of all those having a special knowledge of any portion of the earth's surface. The globe will revolve slowly, and will be observed from the upper end of a spiral gallery to be erected for this purpose.

THE Tokyo Botanical Society is doing excellent work in making known studies of the native flora carried on by its members. The last number of the journal of the Society, *The Botanical Magazine*, contains the following articles: Notes on the Plants collected in Suruga, Totomi, Yamato and Kii, by M. Shirai; On the Smut of Japanese Cereals, by S. Hori; Salix of Hokkaido, by Y. Tokubuchi; Plants employed in Medicine in the Japanese Pharmacopoeia, by K. Sawarda; Contribution to Knowledge of the Marine Algae of Japan, by K. Okamura; Phanerogams of Shonai, by T. Kawakami. The first four articles are in Japanese.

THE first part of the 9th volume of the Proceedings and Transactions of the Nova Scotia Institute of Science contains an account of the work of the session of 1894–95. The papers are of interest, as they contain chiefly observations regarding the local geology, antiquities, flora, etc., of the region. The address of the President, the late Prof. George Lawson, reviewed the history of the Institute, which was founded in 1862, with special reference to the work of the preceding session.

M. WILLIAM VOGT has prepared a biography of his father, Carl Vogt, which has been published by Reinwald under the title *La vie d'un homme—Carl Vogt.*

IT has been decided to erect a statue of Jenner in Tokyo; 1000 yen have been subscribed by the private Sanitary Association, and it is estimated that 2,500 yen will remain after the expenses of the recent centennial have been defrayed, which will be devoted to the purpose. The statue is to be ordered from London.

WE quote the following from *Nature:* "Dr. Brown Goode makes the following comparison in a report of the U. S. National Museum, lately issued: 'There is not a department of the British government to which a citizen has a right to apply for information upon a scientific question. This seems hard to believe, for I cannot think of any scientific subject regarding which a letter, if addressed to the scientific bureaus in Washington, would not receive a full and practical reply. It is estimated that not less than 20,000 such letters are received each year. The Smithsonian Institution and National Museum alone receive about 6,000, and the proportion of these from the new States and Territories, which have not yet developed institutions of learning of their own, is the largest. An intelligent question from a farmer of the frontier receives as much attention as a communication from a Royal Academy of Sciences, and often takes more time for the preparation of the reply.' It is little to the credit of the British government that Dr. Goode's comparison should be so much to our disadvantage."

LAST year Mr. George W. Breckenridge, of San Antonio, presented to the University of Texas 'The Singley Collection of Texas Mollusca.' This unique gathering of shells was the work of Mr. J. A. Singley, who devoted much time and energy to its production. It is unrivaled, we believe, in the world, embracing 309 species, represented by 6143 specimens from 977 localities. This year the same generous donor has added to his previous gift the remainder of the 'Singley Collection,' consisting of shells from all parts of the world: Marine shells, 750 species and varieties, represented by 2350 specimens; land shells, 1101 species and varieties, represented by 3839 specimens; fresh

water shells, 702 species and varieties, represented by 1947 specimens. In this collection there are, it will be seen, over 2500 species and varieties. It is safe to say that the University of Texas has now the largest and finest collection of recent mollusca in the South or West.

THE 'Bibliography and Index of North American Geology, Paleontology, Petrology, and Mineralogy for 1892 and 1893,' by F. B. Weeks, has been issued as Bulletin No. 130, of the U. S. Geological Survey. This Bulletin is a continuation of the annual publication heretofore known as the 'Record of North American Geology' (Bulletins Nos. 44, 75, 91, 99). The extended scope of the work necessitated a change in its arrangement. It is divided into two parts, a bibliography and a subject index. The bibliography is arranged alphabetically by authors' names. The index comprises geographic, geologic mineralogic, paleontologic and petrologic subdivisions, arranged alphabetically; and lists of economic products, minerals, rocks and fossils described in the various papers listed in the bibliography are given. A similar bibliography and index for the year 1894, and another for the year 1895 (Bulletins Nos. 135 and 149, respectively), are in press and will be delivered soon.

THE deficiency of rainfall in Great Britain is this year even greater than last, being so far 4.69 inches. The East London Water Works Company has been compelled to shut off the supply of water during the night, and lack of sufficient water in the east end of London is apt to be followed by an increased mortality.

THE *Lancet* states that an important Royal Commission has just been appointed. Its object is to enquire into the administrative procedure available for controlling danger to man through the use as food of the meat or milk of tuberculous animals. The Commission will further consider what should be the proper action of the responsible authorities in condemning for the purposes of food supplies, animal carcasses or meat exhibiting any stage of tuberculosis. The Commissioners are as follows: Sir Herbert Maxwell, Dr. Thorne Thorne, C. B., Mr. G. T. Brown, C. B., Mr. H. E. Claver, Mr. Shirley F. Murphy, Mr. John Speir and Mr. T. C. Trench. Dr. T. M. Legge will act as Secretary to the Commission, the work of which, from a sanitary point of view, should be of the highest possible value to the community.

ACCORDING to *Nature* General M. Rykatchef has been appointed Director of the Central Physical Observatory, St. Petersburg, in the place of Dr. H. Wild, resigned. For many years General Rykatchef has had charge of the maritime meteorological branch of the Observatory.

UNIVERSITY AND EDUCATIONAL NEWS.

FOREIGN STUDENTS IN THE FRENCH UNIVERSITIES.

OFFICIAL information has been received in Washington by the Franco-American Committee, organized for the purpose of securing fuller privileges for American students in the educational institutions of France, that in all probability the faculties of letters will soon be open to Americans as freely as the other faculties that have already been opened. The Compagnie Transatlantique offers a reduction of 30 per cent. in its rates to duly certified American students who intend to study in France.

There are already fifty or more American students enrolled in the French faculties. Since the promulgation of the decree of January last, changing the regulations in the faculties of science, the number of German students in the French faculties has increased from fifty-two to one hundred and twelve, of whom only sixteen are students of medicine.

The admission of foreign students to the medical schools gave rise to a serious debate in a recent session of the Chamber of Deputies, it being claimed that French students were exposed to undue competition on account of the influx of foreigners, who, by reason of graduation, became entitled to practice medicine in France, and this without being subjected to military duty. It is probable that the regulations will be modified so that foreigners will not be hereafter entitled to the privilege of practice, although the facilities for study and the obtaining of degrees will be as good or better than heretofore.

GENERAL.

DISPATCHES to the daily papers from Lansing, Mich., state that the Supreme Court de-

cided on July 28th that the State Legislature has no right to interfere with or dictate the management of the University of Michigan. The Legislature passed an act at its last session directing the regents to establish the homeopathic department of the University in Detroit. The regents refused to comply on the ground that the act was unconstitutional, and a mandamus was asked for to compel them to establish the department in Detroit. The Court holds that the regents have the sole control of the University and that the act of the Legislature is invalid.

GROUND has been broken for the new science hall at Lake Erie Seminary, O. Of the $20,000 required for the completion of the building, $14,000 has already been raised. In addition $10,000 has been subscribed for equipment.

DR. H. T. LUKENS, of Clark University, has been appointed professor of education at Bryn Mawr College, and Dr. Colin A. Scott to the chair of experimental psychology and child study at the Chicago Normal School.

MR. BEN F. HILL, B. S., has been appointed Fellow in Geology at the University of Texas. He will assist in the laboratory instruction in paleontology and mineralogy under the direction of Dr. F. W. Simonds.

MRS. ARTHUR JACKSON has contributed to the Sheffield Medical School the sum of £5,000 towards the endowment of a chair of anatomy, to be called the Arthur Jackson Chair of Anatomy. Mr. Jackson, who died recently, was much interested in the success of the Medical School, and had served it in the capacity of Secretary and Lecturer.

DR. J. NORMAN COLLIE, F.R.S., has been appointed professor of chemistry in the Pharmaceutical Society's School of Pharmacy. Dr. Collie has been for some time associated with Professor Ramsay in the teaching of chemistry at University College, London. The Council of Bedford College for Women, London, has appointed Dr. Thomas Morison Legge, to the professorship of hygiene.

AMONG recent foreign appointments we note the following: Professor Valentiner, of Carlsruhe, has been called to the chair of astronomy in the University of Heidelberg. Professor A. B. Tichamerow has been appointed director of the Zoological Museum at Moscow. Professor Gutermuth, of Aachen, has been made professor of engineering in the technical high school at Darmstadt. Dr. Von Rümker, professor of agriculture in the University of Breslau, has been called to Leipzig. Dr. Henking, of the University of Göttingen, has been promoted to a professorship of zoology, and Dr. H. Biltz, of the University of Greifswald, to a professorship of chemistry. Dr. Schenk, of the University of Bonn, has been elected full professor of botany and director of the botanical gardens at the Technical High School at Darmstadt. Dr. Pauly, docent in the University at Munich, has been promoted to an assistant professorship of applied geometry, and Dr. W. Semmler, of the University of Greifswald, has been made professor of chemistry. Dr. Wachsmuth has been appointed docent in physics in the University of Göttingen, and Dr. Emil Knoblauch docent in botany in the University of Giessen.

DR. ERNST BEYRICH, professor of geology and paleontology, died at Berlin on July 9th at the age of 81 years.

DR. FRANZ REULEAUX, for forty years professor of engineering in the Technical High School at Charlottenburg, has resigned.

DISCUSSION AND CORRESPONDENCE.

THE PERSONAL EQUATION.

IN the admirable heliometric triangulation of the cluster in Coma Berenices, by Dr. F. L. Chase, lately published by the Yale Observatory, the author has not noticed that the cluster is one which was photographed by Mr. Rutherfurd in 1870 and several years since; hence, material is already on record for the proper motions of the group. The cluster will furnish an unusual number of stars which can be observed for personal equation between bright and faint ones, a problem which is not without psychological as well as astronomical interest at the present time. It will be remembered that among very early studies in experimental psychology were those experiments conducted by

Wundt in 1861, which resulted in his important discovery of the Zeitverschiebung, which takes place when the observer connects clock beats heard with the seen positions of a star in apparent motion through the field of the telescope. As this Zeitverschiebung may be either positive or negative, it offers an explanation of the abnormal personal equations (more than a second of time) which Bessel found to take place in his own case, as compared with Argelander and Wilhelm Struve. The variations of personal equation depending on the magnitudes of the stars can most readily be studied by the help of heliometric or photographic relative right ascensions such as are now in progress of publication. The Pleiades, Præsepe and Coma Berenices, as well as the clusters in other parts of the sky which have been photographed by Rutherfurd, deserve careful study by transit observers. The delay in reaction caused by the faintness of the stars is now pretty well recognized by astronomers when the chronograph is used, but there are indications of a similar delay in apperception when the eye and ear method is still retained. Astronomers need to pay especial attention to those magnitudes of stars which are near the point where the observation of transits begins to become difficult.

T. H. SAFFORD.

CINNABAR AND RUTILE IN MONTANA.

TO THE EDITOR OF SCIENCE: I wish to call the attention of your readers to a new locality for cinnabar and rutile. Specimens were sent me from the placer works in the vicinity of Philipsburg, Montana, with the idea that they were hematite and emery. The cinnabar is in small rolled grains, quite pure, and the rutile in small prisms. Neither of these minerals are known to have been found in Montana before. I hope to obtain more definite information concerning the occurrence of these minerals later.

M. E. WADSWORTH.

MICHIGAN MINING SCHOOL,
HOUGHTON, MICH.

PYGMY VILLAGES DISCOVERED IN THE INTERIOR OF SURINAM, GUIANA.

TO THE EDITOR OF SCIENCE: Yesterday I received a letter from an American commercial explorer of Guiana, who had recently met there with villages of typical pygmies, who are not over 4 feet 8 inches in height, and have a 'brilliant reddish-yellow complexion.' They seem to have come from the head waters of the Orinoco, and to be numerous enough to finally settle the problem as to the existence of dwarf races in America. Humboldt heard rumors as to them, but was unduly skeptical. I hope to be able, at the approaching meeting of the American Association at Buffalo, to submit a full description by the explorer, of his interesting discovery.

R. G. HALIBURTON.

BOSTON, MASS., July 29, 1896.

SCIENTIFIC LITERATURE.

Sporozoenkunde. VAN WASIELEWSKI. Ein Leitfaden für Aerzte, Tierärzte und Zoologen. Mit 111 Abbildungen im Text. Jena (Verlag von Gustav Fischer). 1896. Pp. 162. M. 4.

The specialist in parasitology is frequently asked by general zoologists and by physicians for a short comprehensive book, which, while not too technical and detailed, will serve as a general guide to a brief study of the Sporozoa. As a rule he recommends Balbiani's Les Sporozoaires (1884) and Bütschli's Protozoa, I. Bd., II. Abth. (1882), both of which are now rather old; Blanchard's Traité de Zool. méd., I., p. 32–68, Railliet's Traité de Zool. méd. et. agric., I., p. 122–160 (1893), and Braun's Die tierischen Parasiten des Menschen., pp. 47–106 (1895), which though excellent, do not cover the entire field; or possibly Pfeiffer's Die Protozoen als Krankheitserreger (1891)—a book which is very difficult to comprehend, and in which the line between fact and supposition is not always clearly drawn.

To this list of general works we can now add von Wasielewski's *Sporozoenkunde* which forms, in some respects, a very excellent compilation on these parasitic protozoa.

In a general introduction to the Sporozoa the author discusses their (1) distribution, (2) habitat, (3) form, (4) food and motion, (5) reproduction, (6) development, and (7) classification. Each group is then discussed in turn, and brief diagnoses of the more common genera and species are given. Next follows a valuable tabu-

lar list of the parasites, arranged according to their hosts, and finally brief remarks on technique and a short bibliography.

The author recognizes the orders *Gregarinæ*, *Hæmosporidia*, *Coccidia*, *Acystosporidia*, and *Myxosporidia*, while the *Sarcosporidia*, *Amœbosporidia* and *Serosporidia* are given in an 'Anhang.'

In discussing the *Gragarinæ* Léger's classification is adopted. The chapter on *Hæmosporidia* is based almost entirely upon Labbé's writings; in this order the author recognizes only one family the *Drepanididæ*. In the classification of the *Coccidia*, A. Schneider is followed. Labbé's (1894) order *Gymnosporidia* appears as the *Acystosporidia*, and in it are placed the malarial parasites, the parasite of Texas fever and allied forms. In the chapter on the *Myxosporidia* Thélohan is followed.

While the general discussion of the groups is interesting, and the numerous illustrations give the reader unacquainted with these forms a very good idea of the Sporozoa, it is necessary to exercise considerable care in accepting the nomenclature adopted by the author, and further, not to assume that the numerous species mentioned by him in his compendium represent a complete list of the known forms. The reader should, therefore, be warned that this work is more fitted for use in obtaining a knowledge of the morphology and biology than of the classification of the *Sporozoa*. The generic and specific names adopted in many cases, and the authorities to which the binomials have been attributed, do not seem to have been determined by any particular principle. *Pyrosoma* Smith, for instance, is rejected as name of the parasite of Texas fever, on the grounds that it is preoccupied, while *Apiosoma* Wandolleck, (which is also preoccupied) is adopted, and the name *Piroplasma* is overlooked. The parasite of malaria is given as *Hæmamœba laverani*, although neither this generic nor this specific name can stand. *Balbiania gigantea* is quietly included in *Sarcocystis tenella*, notwithstanding the lack of grounds for so doing, while quite a number of other Sarcosporidia which have been described and named as belonging to three different genera are mentioned as '*Sarcocystis spec. inc.*'

It is possibly unfair to criticise these details adversely, yet, as the author includes the zoologists among the persons for whom his work is written, he should have had more regard for zoological customs. On the whole, von Wasielewski's Sporozoenkunde will be a welcome guide to those who desire to study this group, but who are unable to consult the original papers. CH. WARDELL STILES.

Report of the Government Entomologist for the Year 1895, Cape of Good Hope, Department of Agriculture. By C. P. LOUNSBURY.

This little volume illustrates three interesting points: First, that the Government of Cape Colony is an enterprising one, and will not allow itself to fall behind other governments in matters which affect the welfare of the agricultural community; second, that in appointing an entomologist it was considered to be for the best interests of the Colony that an American, trained in recent American methods in the warfare against insects, should be chosen; and third, that this American has in so short a time familiarized himself with the needs of the Colony in his own special line of work, and has presented as his first report a most excellent account of the species which are attracting particular attention at the present time in that country. The report is largely general and much attention is paid to the subject of the importation of injurious insects and of the desirability of legislation to check importation and spread. The species especially considered are certain scale insects, the peach maggot, codling moth, pear slug, the apple and quince borer and the so-called American blight, which is the name generally used in English colonies for the wooly root-louse of the apple, Schizoneura lanigera. The Government of Cape Colony is to be congratulated upon its appointment.

L. O. H.

Tenth Annual Report of the New York State Entomologist. By J. A. LINTNER, PH.D.

It is always a pleasure to receive a new report from Dr. Lintner. The full and careful articles which the reports of this writer always contain are models in style and treatment for the younger generation of economic entomolo-

gists. The present report, although smaller than some of its predecessors, contains the usual array of important articles, the most interesting of which are the account of *Phora agaraci*, a little fly which damages mushrooms, and which is largely the cause of the impracticability of mushroom cultivation during the summer months; an account of the 1894 occurrence of the seventeen-year locust in New York State, and of the grasshopper plague in western New York. The present report contains a valuable appendix in the shape of an article on scorpion flies, by Dr. Lintner's assistant, Dr. E. P. Felt, who describes the heretofore unknown larvæ of *Panorpa rufescens*. The report also contains an elaborate index to Reports I. to X., which renders at once available nearly all of the results of Dr. Lintner's able work since he has held the position of State Entomologist of New York. This general index means more than appears at first glance, on account of the custom which Dr. Lintner has followed of late of publishing full bibliographies of the insects treated. Thus it becomes an easy matter for a person possessing the ten reports to familiarize himself to a very considerable degree with the literature of a very large number of species.

L. O. H.

La psychologie des sentiments. By TH. RIBOT. Paris, Alcan. Pp. xi+443.

The indefatigable Th. Ribot has given us in his last work, *La Psychologie des Sentiments*, a clear, forcible and succinct summary, professedly from the James-Lange point of view. However, this interpretation is not adhered to very rigorously, and sometimes, indeed, seems directly contradicted (see p. 383 and compare pp. 108 and 187). Yet M. Ribot's main position undoubtedly is that all feeling is a reflex, or, as he would prefer to state it, an aspect of organic changes. But this constant reference to the nature and constitution of the nervous system, or otherwise set forth as tendency, instinct, need, impulse, seems to us highly unsatisfactory explanation. To explain mental forms as knowing and egoism by intuitive fixed tendencies thereto (*e. g.*, p. 192 ff.) appears to us quite on a par with the old intuitive psychology, and not far removed from the much derided metaphysics that explains lion by leoninity. It appears to us that the word 'tendency', whether interpreted physiologically or psychically, is like the word 'chance' in physics and biology, a mere expression to cover ignorance. And it does not better things to assume that physiological and mental are only modes of an unknown something. To explain the known by the unknown may be good metaphysics, but it is certainly bad science. Further, when M. Ribot endorses Spinoza's *dictum* that desire and appetite are the bases of all emotion, we must ask what is desire but an emotion, and what is appetite but pure pain mingled with a feeling toward an unrecognized objectivity?

However, we fully recognize the value of a physiology of feeling, and of a physics and chemistry as well, and we wish that M. Ribot had adhered rigidly to this interpretation, but he often encroaches on psychology where his descriptions are only of the most general and obvious sort and his analyses (*e. g.*, jealousy, p. 264) are greatly lacking in accuracy and thoroughness.

M. Ribot regards fear, anger and sympathy as the universal primitive emotions, closely followed by the self-feeling and sexual feeling, which five are basal, all other emotions being derived by evolution, by arrest of development and by composition. We do not think that the author has here made clear how hate is arrested anger, or how platonic love is arrest of sexual. As to the latter, indeed, he at one place (p. 18) assigns it a rank as culmination of sexual evolution. But, however, this may be, it certainly seems contrary to the first principle of evolution, that any high and late form can be explained as arrest of development of an early form. The whole treatment of this and other principles is far too slight.

M. Ribot touches upon the curious pleasurable pain and painful pleasure, but the treatment is rather unsatisfactory. The taking a pleasure in a pain or *vice versa* is, we think, not uncommon, and merely shows that emotion can develop upon any subject. The child in taking a certain pleasure in picking its own sores has a relief from *ennui* and an emotion of effective activity. The desire to feel, to do, to know, help explain this pleasure. Alphonse Daudet

is said to take great pleasure in his fear experiences, but this may be a case of mere reaction from over-refined emotion, or it may be artistic emotion. The whole subject demands a large and detailed treatment.

This volume adds little to our knowledge. M. Ribot refers the very highest emotions to the James-Lange theory, but only in a very general way. Chapter XI. is an original study of affective memory and contains some interesting matter. I incline to believe that the memory of feeling is a far more general fact than M. Ribot makes it, and that, since the interesting is the rememberable, it is the core of all memory. All living in the past is filled with resuscitated feelings, both recalled and recurrent, and both associated with images and with correlated feelings. The difficulty in the study of affective memory is to discriminate between the new and the old, between the anger resuscitated with the thought of the insult and the anger provoked by the thought.

Æsthetic feeling is, as usual, referred to superfluity of energy. However, this theory must explain why great artists and poets are so often starvelings. The truth is, superfluity expends itself in the easiest channel for the individual, which for most men is apt to be hunting or fishing, or fighting. Superfluity may be one condition of rise and progress of æsthetic, just as there must be a certain fund of available energy for the rise of any higher emotion, but it cannot in itself explain æstheticism.

On the whole, while we can commend M. Ribot's work as a useful summary, we can not speak highly of its originality, its thoroughness or its fairness of tone. It is often narrow and dogmatic, and though the author is sufficiently eclectic in his field it is an eclecticism little vindicated. HIRAM M. STANLEY.

SCIENTIFIC JOURNALS.

AMERICAN CHEMICAL JOURNAL, JULY.

Oxidation of Sodium Sulphide and Hydrosulphide to the Sulphate by Electrolysis: By F. W. DURKEE. Sodium sulphide and hydrosulphide are completely oxidized to sulphate when a current is passed through the solution. When carbon or copper electrodes were used, no oxidation took place; but when platinum ones were substituted, the formation of sulphate was quite rapid. When the current is first passed through, considerable hydrogen is set free at the negative electrode; but very little oxygen escapes at the positive electrode. The oxygen is used up in oxidizing some of the sulphide to thiosulphate, and this in turn to sulphate, setting sulphur free. This free sulphur, which separates as a white cloud, is partly dissolved in the sulphides forming polysulphides, which color the solution yellow. These polysulphides are in turn oxidized, and so it continues until all has been oxidized to sulphate, which point is reached when no further separation of sulphur takes place. The presence of these different products was shown by quantitative determinations of the substances present at different stages of the oxidation. Both direct and alternating currents were used, but the former were found more suitable for the purpose.

A Method for Obtaining Crystalline Silicon: By G. DE CHALMOT. By heating a mixture of silica, carbon and oxides of metals in an electric furnace, crystals of silicon can be obtained. These can be obtained in almost pure condition by treating the product with hydrochloric and hydrofluoric acids. When oxide of manganese is used, a manganese silicide having the composition $MnSi_2$ is formed.

On Some Mercury Salts of the Anilides: By H. L. WHEELER and B. W. MCFARLAND. So little attention had been given to the methods of formation and reactions of these compounds that no conclusions could be drawn as to their structure. In this paper the authors give the results of their work and conclude that the metal is joined to the nitrogen and not to the oxygen, as has been suggested. When formanilide is treated with mercuric bromide, a mercuric formanilide is formed; and when this is treated with benzoyl chloride, halogen mercury compounds are formed, which are undoubtedly nitrogen derivatives. Nitrogen substituted anilides, whose reactions can only be explained on the supposition that the metal is joined to nitrogen, are also formed.

On the use of Antimony Trichloride in the Synthesis of Aromatic Ketones: By W. J. COMSTOCK. In some cases antimony trichloride is preferable, as

a condensing agent, to aluminium chloride, on account of its cheapness and the fact that it is more stable and can be easily recovered again. It cannot be used, however, with low-boiling chlorides, and also fails in some cases where aluminium chloride can be used, as in the formation of triphenylmethane from chloroform and benzene. Several examples are given of the different classes of compounds with which it can be used and the yields as compared with the other method.

The Action of Sodium on Aldehyde: By P. C. FREER. On account of the great instability of the compound formed by the action of sodium on aldehyde, the latter is mixed with benzoyl chloride and then added to the sodium in ether. The compound formed can be isolated in pure condition and obtained as white crystals. Determinations of its composition, molecular weight and decomposition show it to be aldehydoaldol benzoate. The authors consider the product first formed by the action of sodium on adelhyde to be sodium aldehyde or sodium vinyl alcohol $CH_2 : CHONa$. In this compound the metal is joined to the oxygen.

On the Constitution of Some Derivatives of Formic Acid: By P. C. FREER and P. L. SHERMAN, JR. Attention is called to the fact that formic acid, although classed with the acetic acid series, does not exhibit physical properties in conformity with the rest of the series. It is stated by some authors that this acid acts both as acid and aldehyde, but the evidence in favor of the latter is very slight. A study of sodium formylphenylhydrazine seems to show that there is neither a hydroxyl nor aldehyde group in it, while in the salts of formanilide there is evidence of the presence of a hydroxyl grouping. Different groups seem to have different influences and the evidence is not yet sufficient to draw any positive conclusions.

Notes on New Apparatus: By G. O. HIGLEY, B. J. HOWARD and P. C. FREER. Improvements are suggested in the old Hofmann apparatus for showing the electrolysis of hydrochloric acid, and in the Hofmann apparatus for demonstrating the volumes of oxygen and hydrogen which unite to form water vapor. A simple form of apparatus for distillation in a vacuum is also given.

The Action of Metals on Nitric Acid: By G. O. HIGLEY and W. E. DAVIS. In the present paper the authors give the results of the action of nitric acid on silver. In this case nitric oxide and nitrogen peroxide are formed and no nitrous oxide as with copper.

On the Esterification of Halogen Substituted Acetic Acids: By D. M. LICHTY. The author has continued his investigation of the esterification, using lower temperatures, and finds that the results depend on the mass-action of water and alcohol and also on the specific nature of the acid. Starting with acetic acid and introducing one, two, and three atoms of chlorine, he finds that the increase in chlorine influences the rate to a greater extent than it does the limit.

The Constitution of the Acid Amides: By A. LACHMAN. Some doubt has recently been thrown on the generally accepted structure of the amides, and while there seems to be evidence in some cases pointing to the occurrence of the normal amide structure in some compounds, in others it is in favor of the imido hydroxy structure. The author finds that the attempts made so far to test these ideas have failed on account of the great indifference of amides to all the reactions he tried.

Chromic Hydroxide in Precipitation: By H. E. PATTEN. Many hydroxides when precipitated carry down other substances with them and in some cases even decompose them. The present work is a study of the action of potassium hydroxide on chromium chloride in the presence of potassium sulphate. In all cases the precipitation was complete and no sulphate was carried down. Magnesium, calcium and ammonium sulphates behave in the same way; but chlorides and nitrates do not cause precipitation. When the sulphates are not present the hydroxide of cromium dissolves in the excess of alkali. He conceives of two reactions taking place, first a breaking up of the sulphate by the chromium hydroxide and the formation of a compound of sulphur trioxide and chromium sesquioxide, and second, a decomposition of this compound by water.

An Empirical Relation Between Melting-point and Critical Temperature: By F. W. CLARKE. The author draws attention to the ratio between

the melting point and critical temperature of a number of compounds, and shows how this ratio is constant for certain ones; but these belong to such widely different classes of compounds and the facts at hand are so slight that no generalizations can be drawn.

Aluminium Alcoholates: By H. W. Hillyer. When attempts were made to preserve some amalgamated aluminium by keeping it in a solution of mercuric chloride in absolute alcohol, it was found that the aluminium acted quite violently on the alcohol forming aluminium alcoholate. A number of alcohols were found to act in the same way and the subject is now being investigated by the author.

The Conductivity of Solutions of Acetylene in Water: By H. C. Jones. The author calls attention to the fact that the results published by Jones and Allen, showing acetylene to be considerably dissociated in water, are not correct. He has repeated the work and finds that it has a very slight conductivity. He attributes the previous error to some unknown impurity. This number contains reviews of the following books:

Water Supply, W. P. Mason; *A Dictionary of Chemical Solubilities*, A. M. Comey; *Milk, Its Nature and Composition*, C. M. Aikman.

J. Elliott Gilpin.

THE AUK.

The *Auk* for July (Vol. XIII., No. 3) opens with an article by Herbert K. Job, on 'The Ducks of Plymouth County, Massachusetts,' wherein the author presents the results of many years' observations in a condensed report on the 28 species known to occur. Dr. Walter Faxon gives, with prefatory remarks, a list of nearly 200 drawings of Georgia birds made by John Abbot between 1790 and 1810. Some 160 species are represented, including several which were then unknown to science. Publication, or rather the lack of it, seems to have been Abbot's only bar to immortality as an ornithologist.

Mr. O. Widmann discourses pleasantly on 'The Peninsula of Missouri as a Winter Home for Birds,' and Mr. A. W. Anthony gives evidence of the breeding of the Black-vented Shearwater off the coast of southern California with other interesting notes on the habits of this species. In giving his 'Observations on *Histrionicus histrionicus* in Maine,' Mr. Arthur H. Norton writes of a comparatively little known species, while Mr. Ruthven Deane adds a page to the life history of the Passenger Pigeon, in which our interest increases as it 'takes its flight.' Notes from Bermuda, that refuge for feathered waifs and strays, are always of value, and in commenting on the Bermudan avifauna Dr. Prentiss tells of the recent colonization of the Mocking-bird and European Goldfinch. The latter was accidentally introduced in 1893 by escaping from a vessel at St. George's, and so favorable have the conditions proved that already it is quite common. The English sparrow, the most abundant resident species, is spoken of as 'aggressive, offensive and despised.'

Somewhat over a dozen pages are devoted to reviews of recent ornithological books and papers, and about an equal number to records of the capture of more or less rare species or brief original observations of unusual interest.

The colored plate of this issue is an excellent illustration of the handsome Ptarmigan (*Lagopus evermanni*), from Attu Island, described by Mr. D. G. Elliot in the January number.

NEW BOOKS.

Prantl's Lehrbuch der Botanik. Herausgegeben und neu bearbeitet von Dr. Ferdinand Pax. 10th edition. Leipzig, Wilhelm Engelmann. 1896. Pp. x+406. M. 4.

Grundriss der Entwicklungs geschichte des Menschen und der Säugethiere. Dr. Oscar Schultze. Leipzig, Wilhelm Engelmann. 1896. Erste hälfte Bogen 1–11. Pp. 176. M. 5.

Studien zu Methodenlehre und Erkenntnisskritik. Friedrich Dreyer. Leipzig, Wilhelm Engelmann. 1895. Pp. xiii+223. M. 4.

Psychologische Arbeiten. Herausgegeben von Emil Kraepelin. Leipzig, Wilhelm Engelmann. Hefte I., II., III. Pp. 488. M. 12.

Beiträge zur Psychologie und Philosophie. Herausgegeben von Dr. Götz Martius. Leipzig, Wilhelm Engelmann. Bd. I. Heft I. Pp. 159. M. 4.